

WHAT IS CLAIMED IS:

1. A method of speech recognition based interactive information retrieval for ascertaining and retrieving a target information of a user by determining a retrieval key entered by the user using a speech recognition processing, comprising the steps of:
- (a) storing retrieval key candidates that constitute a number of data that cannot be processed by the speech recognition processing in a prescribed processing time, as recognition target words in a speech recognition database, the recognition target words being divided into prioritized recognition target words that constitute a number of data that can be processed by the speech recognition processing in the prescribed processing time and that have relatively higher importance levels based on statistical information defined for the recognition target words, and non-prioritized recognition target words other than the prioritized recognition target words;
 - (b) requesting the user by a speech dialogue with the user to enter a speech input indicating the retrieval key, and carrying out the speech recognition processing for the speech input with respect to the prioritized recognition target words to obtain a recognition result;
 - (c) carrying out a confirmation process using a speech dialogue with the user according to the recognition result to determine the retrieval key, when the recognition result satisfies a prescribed condition for judging that the retrieval key can be determined only by a confirmation process with the user;
 - (d) carrying out a related information query using a speech dialogue with the user to request the user to enter another speech input indicating a related information of the retrieval key, when the recognition result does not satisfy the prescribed condition;

(e) carrying out the speech recognition processing for the another speech input to obtain another recognition result, and adjusting the recognition result according to the another recognition result to obtain adjusted recognition

5 result; and

(f) repeating the step (c) or the steps (d) and (e) using the adjusted recognition result in place of the recognition result, until the retrieval key is determined.

10 2. The method of claim 1, wherein the step (d) also carries out the speech recognition processing for the speech input with respect to as many of the non-prioritized recognition target words as a number of data that can be processed by the speech recognition processing in the
15 prescribed processing time to obtain additional recognition result, while carrying out the related information query using the speech dialogue with the user, and

the step (e) also adjusts the recognition result by adding the additional recognition result.

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3. The method of claim 2, wherein the non-prioritized recognition target words are subdivided into a plurality of sets each containing a number of recognition target words that can be processed by the speech recognition processing
25 in the prescribed processing time, and

the step (d) carries out the speech recognition processing for the speech input with respect to the plurality of sets in an order of the importance levels of the recognition target words contained in each set.

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4. The method of claim 1, wherein the recognition result indicates recognition retrieval key candidates and their recognition likelihoods and the another recognition result indicates recognition related information candidates and
35 their recognition likelihoods, and

the step (e) adjusts the recognition result by calculating new recognition likelihoods for the recognition retrieval key candidates according to recognition likelihoods for the recognition retrieval key candidates indicated in the recognition result and recognition likelihoods for the recognition related information candidates indicated in the another recognition result.

5. The method of claim 4, wherein the step (e) calculates the new recognition likelihoods for the recognition retrieval key candidates by multiplying a recognition likelihood of each recognition retrieval key candidate with a recognition likelihood of a corresponding recognition related information candidate.

6. The method of claim 1, wherein the recognition result indicates recognition retrieval key candidates and their recognition likelihoods, and

the step (c) judges that the recognition result satisfies the prescribed condition, when a number of recognition retrieval key leading candidates which have recognition likelihoods that are exceeding a prescribed likelihood threshold is less than or equal to a prescribed number but not zero.

7. The method of claim 1, wherein the statistical information used at the step (a) is access frequencies of the retrieval key candidates.

8. The method of claim 1, wherein the prescribed processing time used at the step (a) is a real dialogue processing time specified in advance.

9. The method of claim 1, wherein the retrieval key indicates an attribute value of one attribute of the target

information, and the related information requested by the related information query of the step (d) is an attribute value of another attribute of the target information other than the one attribute.

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10. The method of claim 9, wherein attributes of the target information are hierarchically ordered, and the another attribute is a hierarchically adjacent one of the one attribute.

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11. The method of claim 9, wherein the another attribute is selected to be an attribute having attribute value candidates that constitute a number of data that can be processed by the speech recognition processing in the prescribed processing time.

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12. The method of claim 1, wherein the step (a) stores the retrieval key candidates indicating attribute values of a plurality of attributes of the target information, such that the retrieval key entered by the user can indicate an attribute value of any one of the plurality of attributes.

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13. The method of claim 1, wherein the step (a) stores the retrieval key candidates as lower level data, and also stores higher level data that constitute a number of data that can be processed by the speech recognition processing in the prescribed processing time, where each lower level data is dependent on one higher level data and lower level data that are dependent on one higher level data constitute a number of data that can be processed by the speech recognition processing in the prescribed processing time.

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14. The method of claim 13, wherein the step (c) judges that the recognition result satisfies the prescribed condition when the retrieval key can be determined by a

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number of confirmation queries less than or equal to a prescribed number.

15. The method of claim 13, wherein the step (d) judges
5 that the recognition result does not satisfy the prescribed condition when the user negated the prescribed number of the confirmation queries.

16. The method of claim 13, wherein the related
10 information requested by the related information query of the step (d) is a higher level data indicating a generic concept to which a specific concept indicated by the retrieval key belongs.

15 17. The method of claim 16, wherein the step (e) adjusts the recognition result by carrying out another confirmation process using a speech dialogue with the user according to the another recognition result to determine the higher
20 level data, extracting the lower level data that are dependent on determined higher level data as new recognition target data, carrying out the speech recognition processing for the speech input with respect to the new recognition target data to obtain the another recognition result.

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18. A method of speech recognition based interactive
information retrieval for ascertaining and retrieving a
target information of a user by determining a retrieval key
entered by the user using a speech recognition processing,
30 comprising the steps of:

(a) storing retrieval key candidates that are classified according to attribute values of an attribute item in a speech recognition database;

(b) requesting the user by a speech dialogue with the user
35 to enter a speech input indicating an attribute value of

the attribute item for the retrieval key, and carrying out the speech recognition processing for the speech input to obtain a recognition result indicating attribute value candidates and their recognition likelihoods;

- 5 (c) selecting those attribute value candidates which have recognition likelihoods that are exceeding a prescribed likelihood threshold as attribute value leading candidates, and extracting those retrieval key candidates that belong to the attribute value leading candidates as new
10 recognition target data;

- (d) requesting the user by a speech dialogue with the user to enter another speech input indicating the retrieval key, and carrying out the speech recognition processing for the another speech input with respect to the new recognition
15 target data to obtain another recognition result; and

(e) carrying out a confirmation process using a speech dialogue with the user according to the another recognition result to determine the retrieval key.

- 20 19. The method of claim 18, wherein the attribute item is selected to be an attribute having attribute value candidates that constitute a number of data that can be processed by the speech recognition processing in a prescribed processing time.

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- ~~20.~~ A method of speech recognition based interactive information retrieval for ascertaining and retrieving a target information of a user by determining a retrieval key entered by the user using a speech recognition processing,
30 comprising the steps of:

- (a) storing retrieval key candidates that constitute a number of data that cannot be processed by the speech recognition processing in a prescribed processing time as recognition target words, in a plurality of statistically
35 hierarchized databases provided in a speech recognition

database, where lower level statistically hierarchized databases contain increasingly larger part of the retrieval key candidates such that a lowest level statistically hierarchized database contains all the retrieval key

5 candidates;

(b) requesting the user by a speech dialogue with the user to enter a speech input indicating the retrieval key, and carrying out the speech recognition processing for the speech input with respect to all of the plurality of
10 statistically hierarchized databases in parallel, to sequentially obtain respective recognition results indicating recognition retrieval key candidates and their recognition likelihoods;

(c) selecting those recognition retrieval key candidates
15 which have recognition likelihoods that are exceeding a prescribed likelihood threshold as recognition retrieval key leading candidates, for each statistically hierarchized database for which the speech recognition processing is completed; and

20 (d) controlling a next speech dialogue with the user according to whether a prescribed condition that a number of the recognition retrieval key leading candidates is less than or equal to a prescribed number but not zero is satisfied or not.

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21. The method of claim 20, wherein the step (d) further comprises the sub-steps of:

(d1) carrying out a related information query using a speech dialogue with the user to request the user to enter
30 another speech input indicating a related information of the retrieval key, when the prescribed condition is satisfied;

(d2) carrying out the speech recognition processing for the another speech input to obtain another recognition
35 result indicating recognition related information

candidates and their recognition likelihoods, and adjusting the recognition result according to the another recognition result to obtain adjusted recognition result; and

(d3) carrying out a confirmation process using a speech
5 dialogue with the user according to the adjusted recognition result to determine the retrieval key.

22. The method of claim 21, wherein the step (d2) adjusts the recognition result by calculating new recognition
10 likelihoods for the recognition retrieval key candidates according to recognition likelihoods for the recognition retrieval key candidates indicated in the recognition result and recognition likelihoods for the recognition related information candidates indicated in the another
15 recognition result.

23. The method of claim 22, wherein the step (d2) calculates the new recognition likelihoods for the recognition retrieval key candidates by normalizing the
20 recognition likelihoods for the recognition retrieval key candidates indicated in the recognition result, normalizing the recognition likelihoods for the recognition related information candidates indicated in the another recognition result, and multiplying a normalized recognition likelihood
25 of each recognition retrieval key candidate with a normalized recognition likelihood of a corresponding recognition related information candidate that is found to be related to each recognition retrieval key candidate.

30 24. The method of claim 21, further comprising the step of:

(e) checking whether any of prescribed next dialogue leading conditions is satisfied or not, and shifting a recognition target to a next lower level statistically
35 hierarchized database when any of the prescribed next

dialogue leading conditions is satisfied.

25. The method of claim 24, further comprising the steps of:

5 (f) adjusting the recognition result for the next lower level statistically hierarchized database according to a related information of the retrieval key to obtain another adjusted recognition result;

10 (g) selecting those recognition retrieval key candidates which have recognition likelihoods that are exceeding the prescribed likelihood threshold as recognition retrieval key leading candidates, from the another adjusted recognition result; and

15 (h) controlling a next speech dialogue with the user according to whether the prescribed condition that a number of recognition retrieval key leading candidates is less than or equal to a prescribed number but not zero is satisfied or not.

20 26. The method of claim 25, wherein the related information used at the step (f) is information already obtained before the step (e) in a course of processing a higher level statistically hierarchized database.

25 27. The method of claim 25, wherein the related information used at the step (f) is obtained by carrying out a related information query using a speech dialogue with the user to request the user to enter another speech input for a related information of the retrieval key, when
30 no related information of the retrieval key is obtained yet.

28. The method of claim 24, wherein the prescribed next dialogue leading conditions include:

35 (1) a case where the number of the recognition retrieval

key leading candidates is not less than or equal to the prescribed number;

(2) a case where the number of the recognition retrieval key leading candidates is zero;

5 (3) a case where a recognition retrieval key candidate presented to the user in the confirmation process of the step (d3) according to the adjusted recognition result is negated by the user; and

10 (4) a case where no recognition retrieval key leading candidates is found to be related to the recognition related information candidates obtained by the speech recognition processing of the step (d2).

29. The method of claim 20, wherein the step (a) stores
15 the retrieval key candidates in the plurality of statistically hierarchized databases, such that an (n+1)-th level statistically hierarchized database contains a number of the retrieval key candidates that can be processed by the speech recognition processing while carrying out a
20 speech dialogues with the user to determine the retrieval key using an n-th level statistically hierarchized database.

30. The method of claim 20, wherein the step (a) stores
25 the retrieval key candidates in the plurality of statistically hierarchized databases according to importance levels based on statistical information defined for the recognition target words, such that the recognition target words in a higher level statistically hierarchized
30 database have relatively higher importance level than the recognition target words in a lower level statistically hierarchized database.

31. A speech recognition based interactive information
35 retrieval apparatus for ascertaining and retrieving a

target information of a user by determining a retrieval key entered by the user using a speech recognition processing, comprising:

5 a speech recognition database configured to store retrieval key candidates that constitute a number of data that cannot be processed by the speech recognition processing in a prescribed processing time, as recognition target words, the recognition target words being divided into prioritized recognition target words that constitute a
10 number of data that can be processed by the speech recognition processing in the prescribed processing time and that have relatively higher importance levels based on statistical information defined for the recognition target words, and non-prioritized recognition target words other
15 than the prioritized recognition target words;

a speech recognition unit configured to carry out the speech recognition processing; and

a dialogue control unit configured to carry out speech dialogues with the user;

20 wherein the dialogue control unit carries out a speech dialogue for requesting the user to enter a speech input indicating the retrieval key, such that the speech recognition unit carries out the speech recognition processing for the speech input with respect to the prioritized recognition target words to obtain a
25 recognition result;

the dialogue control unit carries out a speech dialogue for a confirmation process according to the recognition result to determine the retrieval key, when the
30 recognition result satisfies a prescribed condition for judging that the retrieval key can be determined only by a confirmation process with the user;

the dialogue control unit carries out a speech dialogue for a related information query to request the
35 user to enter another speech input indicating a related

information of the retrieval key, when the recognition result does not satisfy the prescribed condition, such that the speech recognition unit carries out the speech recognition processing for the another speech input to
5 obtain another recognition result and the dialogue control unit adjusts the recognition result according to the another recognition result to obtain adjusted recognition result, and

the dialogue control unit controls the speech
10 dialogues to repeat the confirmation process or the related information query using the adjusted recognition result in place of the recognition result, until the retrieval key is determined.

15 32. The apparatus of claim 31, wherein the speech recognition unit also carries out the speech recognition processing for the speech input with respect to as many of the non-prioritized recognition target words as a number of data that can be processed by the speech recognition
20 processing in the prescribed processing time to obtain additional recognition result, while the dialogue control unit is carrying out the related information query using the speech dialogue with the user, and

the dialogue control unit also adjusts the recognition
25 result by adding the additional recognition result.

33. The apparatus of claim 32, wherein the speech recognition database stores the non-prioritized recognition target words that are subdivided into a plurality of sets
30 each containing a number of recognition target words that can be processed by the speech recognition processing in the prescribed processing time, and

the speech recognition unit carries out the speech recognition processing for the speech input with respect to
35 the plurality of sets in an order of the importance levels

of the recognition target words contained in each set.

34. The apparatus of claim 31, wherein the speech
recognition unit obtains the recognition result that
5 indicates recognition retrieval key candidates and their
recognition likelihoods and the another recognition result
that indicates recognition related information candidates
and their recognition likelihoods, and
the dialogue control unit adjusts the recognition
10 result by calculating new recognition likelihoods for the
recognition retrieval key candidates according to
recognition likelihoods for the recognition retrieval key
candidates indicated in the recognition result and
recognition likelihoods for the recognition related
15 information candidates indicated in the another recognition
result.

35. The apparatus of claim 34, wherein the dialogue
control unit calculates the new recognition likelihoods for
20 the recognition retrieval key candidates by multiplying a
recognition likelihood of each recognition retrieval key
candidate with a recognition likelihood of a corresponding
recognition related information candidate.

25 36. The apparatus of claim 31, wherein the speech
recognition unit obtains the recognition result that
indicates recognition retrieval key candidates and their
recognition likelihoods, and
the dialogue control unit judges that the recognition
30 result satisfies the prescribed condition, when a number of
recognition retrieval key leading candidates which have
recognition likelihoods that are exceeding a prescribed
likelihood threshold is less than or equal to a prescribed
number but not zero.

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37. The apparatus of claim 31, wherein the statistical information used in the speech recognition database is access frequencies of the retrieval key candidates.

5 38. The apparatus of claim 31, wherein the prescribed processing time used in the speech recognition database is a real dialogue processing time specified in advance.

39. The apparatus of claim 31, wherein the retrieval key
10 indicates an attribute value of one attribute of the target information, and the related information requested by the related information query carried out by the dialogue control unit is an attribute value of another attribute of the target information other than the one attribute.

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40. The apparatus of claim 39, wherein attributes of the target information are hierarchically ordered, and the another attribute is a hierarchically adjacent one of the one attribute.

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41. The apparatus of claim 39, wherein the another attribute is selected to be an attribute having attribute value candidates that constitute a number of data that can be processed by the speech recognition processing in the
25 prescribed processing time.

42. The apparatus of claim 31, wherein the speech recognition database stores the retrieval key candidates indicating attribute values of a plurality of attributes of
30 the target information, such that the retrieval key entered by the user can indicate an attribute value of any one of the plurality of attributes.

43. The apparatus of claim 31, wherein the speech
35 recognition database stores the retrieval key candidates as

lower level data, and also stores higher level data that constitute a number of data that can be processed by the speech recognition processing in the prescribed processing time, where each lower level data is dependent on one
5 higher level data and lower level data that are dependent on one higher level data constitute a number of data that can be processed by the speech recognition processing in the prescribed processing time.

10 44. The apparatus of claim 43, wherein the dialogue control unit judges that the recognition result satisfies the prescribed condition when the retrieval key can be determined by a number of confirmation queries less than or equal to a prescribed number.

15 45. The apparatus of claim 43, wherein the dialogue control unit judges that the recognition result does not satisfy the prescribed condition when the user negated the prescribed number of the confirmation queries.

20 46. The apparatus of claim 43, wherein the related information requested by the related information query carried out by the dialogue control unit is a higher level data indicating a generic concept to which a specific
25 concept indicated by the retrieval key belongs.

47. The apparatus of claim 46, wherein the dialogue control unit adjusts the recognition result by carrying out another confirmation process using a speech dialogue with
30 the user according to the another recognition result to determine the higher level data, extracting the lower level data that are dependent on determined higher level data as new recognition target data, carrying out the speech recognition processing for the speech input with respect to
35 the new recognition target data to obtain the another

recognition result.

48. A speech recognition based interactive information retrieval apparatus for ascertaining and retrieving a target information of a user by determining a retrieval key entered by the user using a speech recognition processing, comprising:

10 a speech recognition database configured to store retrieval key candidates that are classified according to attribute values of an attribute item;

a speech recognition unit configured to carry out the speech recognition processing; and

a dialogue control unit configured to carry out speech dialogues with the user;

15 wherein the dialogue control unit carries out a speech dialogue for requesting the user to enter a speech input indicating an attribute value of the attribute item for the retrieval key, such that the speech recognition unit carries out the speech recognition processing for the speech input to obtain a recognition result indicating attribute value candidates and their recognition likelihoods;

25 the dialogue control unit selects those attribute value candidates which have recognition likelihoods that are exceeding a prescribed likelihood threshold as attribute value leading candidates, and extracts those retrieval key candidates that belong to the attribute value leading candidates as new recognition target data;

30 the dialogue control unit carries out a speech dialogue for requesting the user to enter another speech input indicating the retrieval key, such that the speech recognition unit carries out the speech recognition processing for the another speech input with respect to the new recognition target data to obtain another recognition result; and

the dialogue control unit carries out a speech dialogue for a confirmation process according to the another recognition result to determine the retrieval key.

- 5 49. The apparatus of claim 48, wherein the attribute item is selected to be an attribute having attribute value candidates that constitutes a number of data that can be processed by the speech recognition processing in a prescribed processing time.

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50. A speech recognition based interactive information retrieval apparatus for ascertaining and retrieving a target information of a user by determining a retrieval key entered by the user using a speech recognition processing,

- 15 comprising:

a speech recognition database having a plurality of statistically hierarchized databases configured to store retrieval key candidates that constitute a number of data that cannot be processed by the speech recognition processing in a prescribed processing time as recognition target words, where lower level statistically hierarchized databases contain increasingly larger part of the retrieval key candidates such that a lowest level statistically hierarchized database contains all the retrieval key

- 25 candidates;

a speech recognition unit configured to carry out the speech recognition processing; and

a dialogue control unit configured to carry out speech dialogues with the user;

- 30 wherein the dialogue control unit carries out a speech dialogue for requesting the user to enter a speech input indicating the retrieval key, such that the speech recognition unit carries out the speech recognition processing for the speech input with respect to all of the plurality of statistically hierarchized databases in
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parallel, to sequentially obtain respective recognition results indicating recognition retrieval key candidates and their recognition likelihoods;

the dialogue control unit selects those recognition retrieval key candidates which have recognition likelihoods that are exceeding a prescribed likelihood threshold as recognition retrieval key leading candidates. for each statistically hierarchized database for which the speech recognition processing is completed; and

10 the dialogue control unit controls a next speech dialogue with the user according to whether a prescribed condition that a number of the recognition retrieval key leading candidates is less than or equal to a prescribed number but not zero is satisfied or not.

15 51. The apparatus of claim 50, wherein the dialogue control unit controls the next speech dialogue by:

carrying out a speech dialogue for a related information query to request the user to enter another speech input indicating a related information of the retrieval key. when the prescribed condition is satisfied, such that the speech recognition unit carries out the speech recognition processing for the another speech input to obtain another recognition result indicating recognition related information candidates and their recognition likelihoods.

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adjusting the recognition result according to the another recognition result to obtain adjusted recognition result; and

30 carrying out a speech dialogue for a confirmation process according to the adjusted recognition result to determine the retrieval key.

52. The apparatus of claim 51, wherein the dialogue control unit adjusts the recognition result by calculating

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new recognition likelihoods for the recognition retrieval
key candidates according to recognition likelihoods for the
recognition retrieval key candidates indicated in the
recognition result and recognition likelihoods for the
5 recognition related information candidates indicated in the
another recognition result.

53. The apparatus of claim 52, wherein the dialogue
control unit calculates the new recognition likelihoods for
10 the recognition retrieval key candidates by normalizing the
recognition likelihoods for the recognition retrieval key
candidates indicated in the recognition result, normalizing
the recognition likelihoods for the recognition related
information candidates indicated in the another recognition
15 result, and multiplying a normalized recognition likelihood
of each recognition retrieval key candidate with a
normalized recognition likelihood of a corresponding
recognition related information candidate that is found to
be related to each recognition retrieval key candidate.

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54. The apparatus of claim 51, wherein the dialogue
control unit also checks whether any of prescribed next
dialogue leading conditions is satisfied or not, and shifts
a recognition target to a next lower level statistically
25 hierarchized database when any of the prescribed next
dialogue leading conditions is satisfied.

55. The apparatus of claim 54, wherein the dialogue
control unit adjusts the recognition result for the next
30 lower level statistically hierarchized database according
to a related information of the retrieval key to obtain
another adjusted recognition result, selects those
recognition retrieval key candidates which have recognition
likelihoods that are exceeding the prescribed likelihood
35 threshold as recognition retrieval key leading candidates,

from the another adjusted recognition result, and controls a next speech dialogue with the user according to whether the prescribed condition that a number of recognition retrieval key leading candidates is less than or equal to a prescribed number but not zero is satisfied or not.

56. The apparatus of claim 55, wherein the related information used in adjusting the recognition result for the next lower level statistically hierarchized database is information already obtained before shifting the recognition target to the next lower level statistically hierarchized database in a course of processing a higher level statistically hierarchized database.

57. The apparatus of claim 55, wherein the related information used in adjusting the recognition result for the next lower level statistically hierarchized database is obtained by carrying out a speech dialogue for a related information query to request the user to enter another speech input for a related information of the retrieval key, when no related information of the retrieval key is obtained yet.

58. The apparatus of claim 54, wherein the prescribed next dialogue leading conditions include:

- (1) a case where the number of the recognition retrieval key leading candidates is not less than or equal to the prescribed number;
- (2) a case where the number of the recognition retrieval key leading candidates is zero;
- (3) a case where a recognition retrieval key candidate presented to the user in the confirmation process according to the adjusted recognition result is negated by the user; and
- (4) a case where no recognition retrieval key leading

candidates is found to be related to the recognition related information candidates obtained by the speech recognition processing.

- 5 59. The apparatus of claim 50, wherein the speech recognition database stores the retrieval key candidates in the plurality of statistically hierarchized databases, such that an (n+1)-th level statistically hierarchized database contains a number of the retrieval key candidates that can
10 be processed by the speech recognition processing while carrying out a speech dialogues with the user to determine the retrieval key using an n-th level statistically hierarchized database.
- 15 60. The apparatus of claim 50, wherein the speech recognition database stores the retrieval key candidates in the plurality of statistically hierarchized databases according to importance levels based on statistical information defined for the recognition target words, such
20 that the recognition target words in a higher level statistically hierarchized database have relatively higher importance level than the recognition target words in a lower level statistically hierarchized database.
- 25 ~~61~~. A computer usable medium having computer readable program codes embodied therein for causing a computer to function as a speech recognition based interactive information retrieval system for ascertaining and retrieving a target information of a user by determining a
30 retrieval key entered by the user using a speech recognition processing and a speech recognition database for storing retrieval key candidates that constitute a number of data that cannot be processed by the speech recognition processing in a prescribed processing time, as
35 recognition target words in a speech recognition database,

the recognition target words being divided into prioritized recognition target words that constitute a number of data that can be processed by the speech recognition processing in the prescribed processing time which have relatively higher importance levels based on statistical information defined for the recognition target words, and non-prioritized recognition target words other than the prioritized recognition target words, the computer readable program codes include:

10 a first computer readable program code for causing said computer to request the user by a speech dialogue with the user to enter a speech input indicating the retrieval key, and carry out the speech recognition processing for the speech input with respect to the prioritized

15 recognition target words to obtain a recognition result;

a second computer readable program code for causing said computer to carry out a confirmation process using a speech dialogue with the user according to the recognition result to determine the retrieval key, when the recognition result satisfies a prescribed condition for judging that the retrieval key can be determined only by a confirmation process with the user;

a third computer readable program code for causing said computer to carry out a related information query using a speech dialogue with the user to request the user to enter another speech input indicating a related information of the retrieval key, when the recognition result does not satisfy the prescribed condition;

a fourth computer readable program code for causing said computer to carry out the speech recognition processing for the another speech input to obtain another recognition result, and adjust the recognition result according to the another recognition result to obtain adjusted recognition result; and

35 a fifth computer readable program code for causing

said computer to repeat processing of the second computer readable program code or the third and fourth computer readable program codes using the adjusted recognition result in place of the recognition result, until the
5 retrieval key is determined.

62. A computer usable medium storing a data structure to be used as a speech recognition database in a speech recognition based interactive information retrieval system
10 for ascertaining and retrieving a target information of a user by determining a retrieval key entered by the user using a speech recognition processing, the data structure comprising:

retrieval key candidates that constitute a number of
15 data that cannot be processed by the speech recognition processing in a prescribed processing time, as recognition target words, the recognition target words being divided into prioritized recognition target words that constitute a number of data that can be processed by the speech
20 recognition processing in the prescribed processing time which have relatively higher importance levels based on statistical information defined for the recognition target words, and non-prioritized recognition target words other than the prioritized recognition target words.

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63. The computer usable medium of claim 62, wherein the data structure stores the retrieval key candidates as lower level data, and also stores higher level data that constitute a number of data that can be processed by the
30 speech recognition processing in the prescribed processing time, where each lower level data is dependent on one higher level data and lower level data that are dependent on one higher level data constitute a number of data that can be processed by the speech recognition processing in
35 the prescribed processing time.

64. A computer usable medium having computer readable program codes embodied therein for causing a computer to function as a speech recognition based interactive information retrieval system for ascertaining and retrieving a target information of a user by determining a retrieval key entered by the user using a speech recognition processing and a speech recognition database for storing retrieval key candidates that are classified according to attribute values of an attribute item, the computer readable program codes include:

a first computer readable program code for causing said computer to request the user by a speech dialogue with the user to enter a speech input indicating an attribute value of the attribute item for the retrieval key, and carry out the speech recognition processing for the speech input to obtain a recognition result indicating attribute value candidates and their recognition likelihoods;

a second computer readable program code for causing said computer to select those attribute value candidates which have recognition likelihoods that are exceeding a prescribed likelihood threshold as attribute value leading candidates, and extract those retrieval key candidates that belong to the attribute value leading candidates as new recognition target data;

a third computer readable program code for causing said computer to request the user by a speech dialogue with the user to enter another speech input indicating the retrieval key, and carry out the speech recognition processing for the another speech input with respect to the new recognition target data to obtain another recognition result; and

a fourth computer readable program code for causing said computer to carry out a confirmation process using a speech dialogue with the user according to the another

recognition result to determine the retrieval key.

65. A computer usable medium having computer readable program codes embodied therein for causing a computer to
- 5 function as a speech recognition based interactive information retrieval system for ascertaining and retrieving a target information of a user by determining a retrieval key entered by the user using a speech recognition processing and a speech recognition database
- 10 having a plurality of statistically hierarchized databases for storing retrieval key candidates that constitute a number of data that cannot be processed by the speech recognition processing in a prescribed processing time as recognition target words, where lower level statistically
- 15 hierarchized databases contain increasingly larger part of the retrieval key candidates such that a lowest level statistically hierarchized database contains all the retrieval key candidates, the computer readable program codes include:
- 20 a first computer readable program code for causing said computer to request the user by a speech dialogue with the user to enter a speech input indicating the retrieval key, and carry out the speech recognition processing for the speech input with respect to all of the plurality of
- 25 statistically hierarchized databases in parallel, to sequentially obtain respective recognition results indicating recognition retrieval key candidates and their recognition likelihoods;
- a second computer readable program code for causing
- 30 said computer to select those recognition retrieval key candidates which have recognition likelihoods that are exceeding a prescribed likelihood threshold as recognition retrieval key leading candidates, for each statistically hierarchized database for which the speech recognition
- 35 processing is completed; and

a third computer readable program code for causing
said computer to control a next speech dialogue with the
user according to whether a prescribed condition that a
number of the recognition retrieval key leading candidates
5 is less than or equal to a prescribed number but not zero
is satisfied or not.

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